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A preliminary study of bird use of fig *Ficus* species in Amurum Forest Reserve, Nigeria

by Barnabas H. DARU[1], Kowiyou YESSOUFOU[2], Clive NUTTMAN[3] & Jacinta ABALAKA[4]

[1]Department of Plant Science, University of Pretoria,
Private Bag X20, Hatfield 0028, South Africa. <darunabas@gmail.com>
[2]Department of Environmental Sciences, University of South Africa, South Africa
[3]Tropical Biology Association, Department of Zoology, University of Cambridge,
Downing Street, Cambridge CB2 3EJ, U.K.
[4]A.P. Leventis Ornithological Research Institute, Laminga, P.O. Box 13404 Jos, Nigeria

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Summary

While fig trees (*Ficus*: Moraceae) are acknowledged as keystone resources for frugivore communities in tropical forests, their detailed use by frugivores is often poorly understood. In this study, we found over 400 fig trees of 12 species in Amurum Forest Reserve, Nigeria. We analyse bird visits to 12 individual trees of eight *Ficus* species, observed over a two-year period (2007–9), during which we recorded 3234 visits by 48 bird species. Different fig trees received between 23 and 826 visits during our observations; the diurnal pattern of visits was similar for all fig species, with clear morning (8h00–9h30, larger) and late afternoon (16h00, lesser) peaks, with a lull in visits around mid-day. Mean visit duration varied between 2.9 ± 1.8 min. and 20.5 ± 19.2 min. (mean ± SD) at different fig species. Birds ate between 1.7 ± 1.1 and 5.2 ± 4.4 figs per visit at different fig species. Our study provides preliminary information on *Ficus*–bird associations and confirms that figs are important resources for frugivorous birds in Amurum Forest Reserve. We suggest that at least four *Ficus* species provide disproportionately important resources for frugivorous birds: *F. lutea*, *F. ingens*, *F. thonningii* and *F. abutilifolia*.

Résumé

Étude préliminaire de la consommation par les oiseaux de figues *Ficus* spp. dans la Réserve de la Forêt d'Amurum, Nigeria. Bien que les figuiers (*Ficus*: Moraceae) soient reconnus comme étant des ressources-clé pour les communautés de frugivores dans les forêts tropicales, leur consommation par les frugivores n'est souvent pas connue avec précision. Dans cette étude, nous

avons trouvé plus de 400 figuiers dans la Réserve de la Forêt d'Amurum, Nigeria. Nous analysons les visites par les oiseaux de 12 arbres appartenant à huit espèces de *Ficus*, observées sur une période de deux ans (2007–9), durant laquelle nous avons noté 3234 visites par 48 espèces d'oiseaux. Les différents figuiers ont reçu entre 23 et 826 visites pendant nos observations; le scénario diurne des visites était le même pour toutes les espèces de figuiers, avec des pics évidents pour le matin (8h00-9h30, le plus important) et la fin d'après-midi (16h00, moins important), avec une pause dans les visites autour de la mi-journée. La durée moyenne des visites aux différentes espèces de figuiers variait entre 2,9 ± 1,8 min. (moyenne ± sdv). Les oiseaux consommaient entre 1,7 ± 1,1 et 5,2 ± 4,4 figues par visite aux différentes espèces de figuiers. Notre étude fournit de premières informations sur les associations *Ficus*–oiseaux et confirme que les figues sont des ressources importantes pour les oiseaux frugivores dans la Réserve de la Forêt d'Amurum. Nous suggérons qu'au moins quatre espèces de *Ficus* fournissent des ressources très importantes pour les oiseaux frugivores: *F. lutea*, *F. ingens*, *F. thonningii* et *F. abutilifolia*.

Introduction

Fig trees (*Ficus*: Moraceae) provide reliable dietary resources for frugivores including birds in tropical forests (Walker 2007), and birds play important ecological roles dispersing fig seeds (Peh & Chong 2003), thus contributing to the maintenance of species diversity (Snow 1981, Wenny & Levey 1998, Holbrook & Smith 2000). Several criteria have been used to define keystone plant species for frugivores including phenology (*e.g.* fructification during periods of general fruit scarcity: White 1994), reliability of fruit production (Leighton & Leighton 1983, Terborgh 1986), abundance of fruit produced (Bond 1993, Peres 2000), and most commonly, population size of frugivores that use specific resources (Peres 2000). Fig trees are well known as a key component of fruit resources in tropical forests (Lambert & Marshall 1991, Shanahan *et al.* 2001, Bleher *et al.* 2003). Over 10% of the world's birds and 6% of mammals consume figs, making *Ficus* the most widely consumed plant genus (Shanahan *et al.* 2001). Despite the long interest in mutually beneficial fig-frugivore interactions (*e.g.* Wheelwright 1985), most fig-frugivore studies have been restricted to the Neotropics and southeast Asia, commonly with limited sample size (number of fig species monitored) and observation period (1–2 weeks) (*e.g.* Shanahan *et al.* 2001, Ragusa-Netto 2002, Bleher *et al.* 2003, Peh & Chong 2003, Tello 2003). In Africa south of the Sahara, *c.* 112 *Ficus* species are recognised, with southern Africa being the centre of diversity (Berg & Wiebes 1992); but detailed information on fig-frugivore interactions is scarce. Long-term research might identify keystone *Ficus* and frugivore species to be prioritised in conservation efforts (Bleher *et al.* 2003).

We report here a two-year study on birds visits to *Ficus* species in Amurum Forest, Nigeria. Amurum holds 278 bird species, 31% of the total recorded in Nigeria, underpinning its status as an "Important Bird Area" and one of Nigeria's key avian biodiversity hotspots (Ezealor 2001) and, therefore, a suitable area to explore fig-bird interactions. We evaluated visit patterns of birds on eight fig species. Our main objective was to identify key frugivores visiting *Ficus* species and potentially guide future conservation programmes in Nigeria. We expected that visitors to a putatively critical food resource would mainly visit for foraging. Thus, we assessed the importance of the various fig species by recording all visits by birds, the time spent by visitors on each tree and the number of figs eaten; we also noted temporal feeding patterns and visitor behaviour on the tree.

Methods

The study was conducted in Amurum Forest Reserve at *c.* 1300 m altitude on the Jos Plateau in north-central Nigeria (9°52′30″N, 8°58′30″E). The reserve, which covers *c.* 300 ha, is a typical savanna woodland dominated by grasses, with scattered rocky outcrops, and strips of riparian forest along streams (Vickery & Jones 2002). In the grassland savanna, common trees and shrubs include *Dichrostachys cinerea*, *Jasminum dichotomum*, *Combretum fragrans* and *Piliostigma thoningii*. The rocky outcrops are characterised by *Parkia biglobosa*, *Acacia ataxacantha* and several *Ficus* species, whereas the most frequent woody plant species in the forest patches are *Boscia angustifolia*, *Harungana madagascariensis*, *Syzygium guineense* and *Ochna schweinfurthiana* (Gofwen 2009). Temperatures in the region are 8–15°C during the coldest months (November–February) and rise to 30–38°C during the warm and dry months (March–April). Mean annual rainfall is 1411 mm, falling mainly between April and October (Payne 1998).

Of the 278 bird species known from Amurum Forest Reserve, at least 58 are, to varying extents, fruit feeders. We here follow Snow (1971) in using "fruit" to mean fleshy fruit. Based on Brown *et al.* (1982), Fry & Keith (2004) and Fry *et al.* (1988, 2000), we classified these 58 species into three main categories: obligate frugivores (18 species) that feed primarily on fruit, partial frugivores (28 species) which have, beside fruits, other major food items (*e.g.* invertebrates), and opportunistic fruit-eaters (12 species) that occasionally eat fruit; in this study we recorded 48 of these 58 species (Table 1). Nomenclature of birds follows Borrow & Demey (2001).

We determined *Ficus* density and diversity in 25 plots of 200 × 200 m (Fig. 1), selected across the reserve using computer-generated random numbers. In each plot, *Ficus* trees were photographed and identified to species level (where possible), the number of trees of each species was counted, and their geographical coordinates taken, allowing us to map their spatial distribution. Keay (1989) and the Fig Web (<www.figweb.org>) were used for species identification.

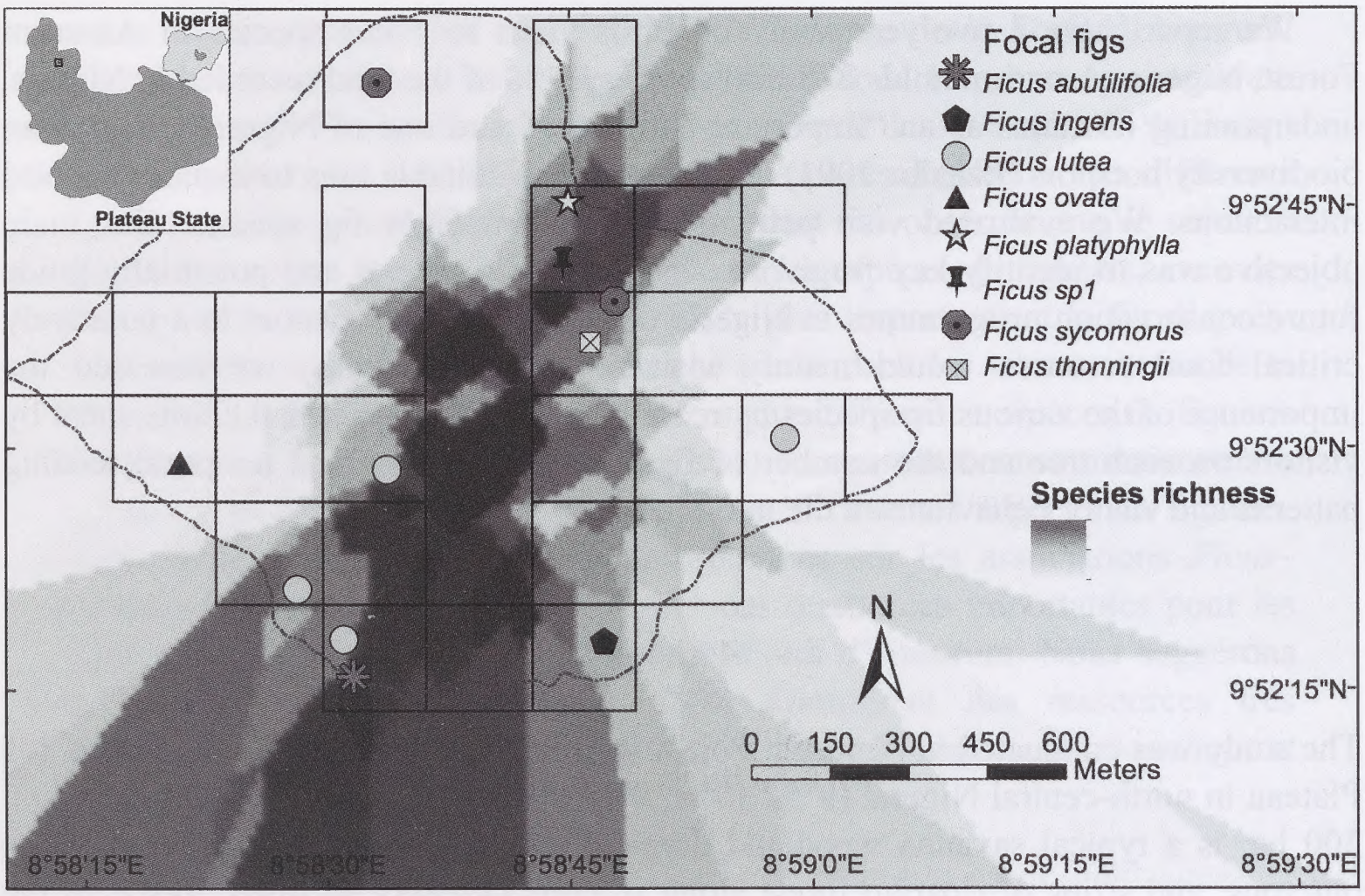

Figure 1. Map of Amurum Forest Reserve showing *Ficus* species richness. The Reserve is the diamond-shaped area. Depth of shading reflects interpolated values of fig species richness from high (dark) to low (light) derived from species richness in the 25 plots using Ordinary Kriging with a 12-cell neighbourhood. The 25 plots are indicated and locations of the 12 *Ficus* trees observed for bird frugivory are shown. Inset: the reserve's position in Plateau State and Nigeria.

Over a two-year period March 2007 to June 2009, we observed bird–fig interactions at 12 individual trees of eight fig species (four trees of *F. lutea*, two of *F. sycomorus*, and one each of *F. abutilifolia*, *F. thonningii*, *F. ingens*, *F. ovata*, *F. platyphylla* and an unidentified *Ficus* species) when they were found fruiting during this period (Fig. 2). Each focal tree was found in fruit once during the study period and observations commenced when the tree was first noted to be fruiting. Hence, we could not be certain of the overall length (in days) of fruiting period, nor did we estimate the number of figs produced by each tree during a fruiting event. For all birds visiting a tree, we recorded the following: species identity and number, time spent in the tree (including eating, perching and moving within the tree), number of figs eaten and handling behaviour. Independence of observations was not assured as birds were not marked: individual birds repeatedly revisiting the same tree would have been classed as different observations. We acknowledge that this may have caused pseudo-replication, but judging from observations of different individuals visiting concurrently, and considering the extended study period, we believe the data

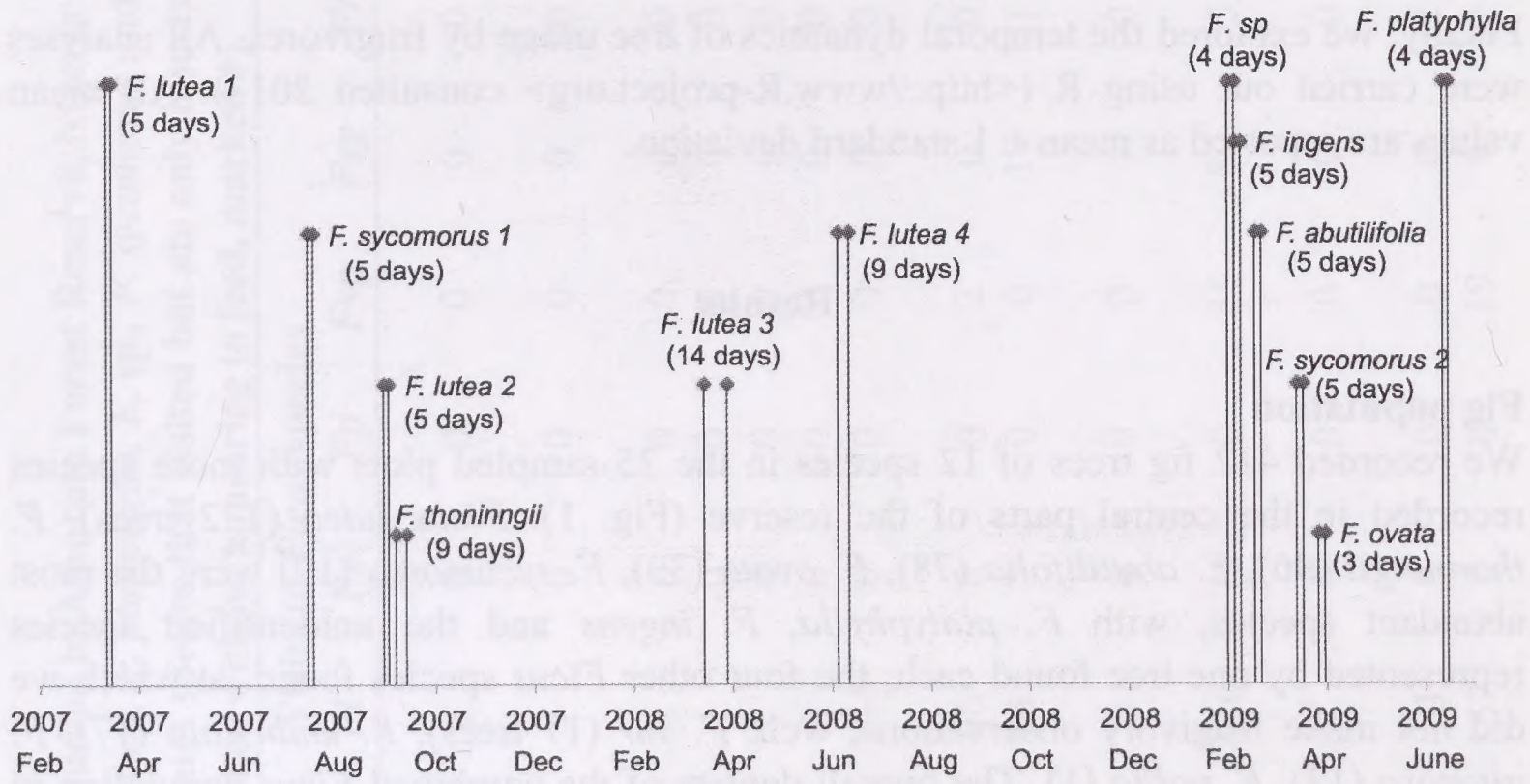

Figure 2. Chronology of observation of bird-fig interactions in Amurum Forest Reserve, Nigeria. The perpendicular lines mark first and last observation day for each tree, and their length is arbitrary to enable legibility. N days in brackets are total observation days on each tree.

on fruit-feeding behaviour to be reliably indicative of true patterns. Visitation was recorded by scan-sampling from a concealed position using binoculars and telescope. Observations consisted of 12 h sessions (6h00–18h00), lasting from the time of ripening of figs on an individual tree through to consumption of the last figs on it, following the method of Tello (2003). We collected quantitative data on visit time (seconds spent on a tree) and fig consumption (number eaten per visit), and also recorded the temporal patterns of visits and the behaviour of visiting birds.

A preliminary analysis showed that foraging activity of frugivores occurred mainly between 6h00-11h00 and 13h00-18h00, with lower activity in the afternoon. We therefore explored the differences between morning (6h00–11h00) and afternoon (13h00–18h00) in the number of figs eaten, time spent on each tree, and number of visits to each tree, using the non-parametric two-sample Kolmogorov-Smirnov test. We also investigated intra-specific differences among individual trees of *Ficus lutea* by analysis of variance (ANOVA), contrasting mean time spent per visit, mean number of figs eaten per visit and number of visits by different bird species, between individual trees (n = 135, 229, 302, 308 for the four trees; sample sizes are the subsets of visits where fig consumption was observed) using Tukey's honest significant difference (HSD). To assess whether these three variables were correlated, we calculated the correlation coefficient and determined its significance using Pearson's product-moment method. Prior to this correlation test, variables were $\log_{10}$-transformed to meet the assumptions of normality and homogeneity of variance.

Finally, we explored the temporal dynamics of tree usage by frugivores. All analyses were carried out using R (<http://www.R-project.org> consulted 2013). All mean values are reported as mean ± 1 standard deviation.

Results

Fig population

We recorded 412 fig trees of 12 species in the 25 sampled plots with more species recorded in the central parts of the reserve (Fig. 1). *Ficus lutea* (122 trees), *F. thonningii* (96), *F. abutilifolia* (78), *F. ovata* (39), *F. sycomorus* (19) were the most abundant species, with *F. platyphylla*, *F. ingens* and the unidentified species represented by one tree found each; the four other *Ficus* species found, at which we did not make frugivory observations, were *F. sur* (17 trees), *F. umbellata* (17), *F. glumosa* (13), *F. polita* (1). The overall density of the combined *Ficus* population in the reserve was 1.35 trees/ha.

Visitation to *Ficus* spp.

We observed 3234 individual bird visits, representing 48 bird species visiting the 12 *Ficus* trees monitored (Table 1). *Ficus lutea* received the most bird species (38 species cumulatively for four individuals, which received 11, 17, 28 and 26 species each: mean species per tree = 20.5), followed by *F. abutilifolia* (19 species), *F. thonningii* and *F.* sp. (17 species each), *F. ingens* (15 species), *F. ovata* (14 species), *F. sycomorus* (18 species cumulatively for two individuals, which received 7 and 16 species each: mean species per tree = 11.5) and *F. platyphylla* (5 species).

More than half of the total number of bird visits (1665) were observed on the four trees of *F. lutea*, followed by *F. abutilifolia*, *F. ingens*, *F.* sp. and *F. sycomorus*, the three remaining species each receiving < 5% of visits (Table 2).

Behaviour

The majority of bird visitors (> 55%) swallowed figs whole. We also observed birds perching and occasionally pecking out parts of the figs (29% of visits). The least frequent behaviour (5% of visits) consisted of birds (three species only, described as opportunistic frugivores and marked with asterisks in Table 1) eating insects rather than figs.

Several bird species visited multiple fig species (Table 1). Among the obligate frugivores, the Common Bulbul and the Yellow-fronted Tinkerbird were recorded on all eight *Ficus* species, and the Speckled Mousebird was recorded on seven of them. Opportunistic and partial frugivores were recorded in up to six species (Table 1).

The longest mean visit times were observed on *Ficus ingens*, followed by *F. ovata* and *F. sycomorus* (Table 2).

Table 1. The total number of visits by each bird species to the eight *Ficus* species studied in Amurum Forest Reserve, Nigeria: *Fa*, *Fi*, *Fl*, *Fo*, *Fp*, *F*sp, *Fsy*, *Ft* correspond to *F. abutilifolia*, *F. ingens*, *F. lutea*, *F. ovata*, *F. platyphylla*, *F.* sp., *F. sycomorus* and *F. thonningii* respectively. The birds' frugivory category (see Methods) also indicates species that visited but ate only insects in the trees (marked *) and species that visited but did not eat figs or insects (*i.e.* perched without appearing to feed, marked †).

	Frugivory category	Visits to *Ficus* species							
		Fa	*Fi*	*Fl*	*Fo*	*Fp*	*F*sp	*Fsy*	*Ft*
Scopidae									
Scopus umbretta Hamerkop	opportunistic†	0	0	1	0	0	0	0	0
Falconidae									
Falco biarmicus Lanner Falcon	opportunistic†	0	0	1	0	0	0	0	0
Columbidae									
Streptopelia hypopyrrha Adamawa Turtle Dove	opportunistic	0	0	2	0	0	0	0	0
S. senegalensis Laughing Dove	opportunistic	0	0	1	0	0	0	0	0
S. vinacea Vinaceous Dove	opportunistic	0	0	1	4	0	0	0	0
Turtur abyssinicus Black-billed Wood Dove	opportunistic	0	0	3	0	0	0	0	0
Treron waalia Bruce's Green Pigeon	obligate	1	0	244	0	0	0	0	0
Musophagidae									
Musophaga violacea Violet Turaco	obligate	41	0	96	0	0	2	0	0
Crinifer piscator Western Grey Plantain-eater	obligate	32	0	95	2	0	0	17	1
Cuculidae									
Centropus senegalensis Senegal Coucal	opportunistic	0	0	0	0	0	0	1	0
Coliidae									
Colius striatus Speckled Mousebird	obligate	113	189	326	73	0	55	80	5
Meropidae									
Merops bulocki Red-throated Bee-eater	opportunistic*	0	0	2	0	0	0	0	0
Bucerotidae									
Tockus erythrorhynchus Red-billed Hornbill	partial	0	0	10	0	0	0	0	1
T. nasutus African Grey Hornbill	obligate	4	1	157	0	0	19	9	1

	Frugivory category	Visits to *Ficus* species							
		Fa	*Fi*	*Fl*	*Fo*	*Fp*	*Fsp*	*Fsy*	*Ft*
Lybiidae									
Pogoniulus chrysoconus Yellow-fronted Tinkerbird	opportunistic	4	1	3	1	2	1	2	1
Lybius dubius Bearded Barbet	obligate	8	4	179	0	0	1	33	23
L. vielloti Vieillot's Barbet	partial	0	0	57	0	0	10	0	7
Picidae									
Dendropicos fuscescens Cardinal Woodpecker	opportunistic	0	0	4	1	0	2	1	0
Mesopicos goertae Grey Woodpecker	opportunistic	0	0	1	0	0	0	0	0
Pycnonotidae									
Pycnonotus barbatus Common Bulbul	obligate	51	46	62	11	10	48	52	16
Chlorocichla flavicollis Yellow-throated Leaflove	obligate	1	4	49	0	0	0	0	4
Turdidae									
Turdus pelios African Thrush	opportunistic	45	4	41	13	0	12	20	0
Muscicapidae									
Myrmecocichla cinnamomeiventris Mocking Chat	opportunistic	11	1	6	0	0	23	0	0
Melaenormis edolioides Northern Black Flycatcher	opportunistic	0	1	1	0	0	0	0	0
Sylviidae									
Eremomela pusilla Senegal Eremomela	opportunistic	17	5	4	0	0	1	1	0
Sylvietta brachyura Northern Crombec	opportunistic	1	0	0	0	1	0	0	1
Phylloscopus trochilus Willow Warbler	opportunistic	0	1	7	0	0	0	0	0
Sylvia borin Garden Warbler	opportunistic	6	0	0	0	0	11	0	0
S. communis Common Whitethroat	opportunistic	1	25	18	2	0	1	13	0
Cisticolidae									
Camaroptera brachyura Grey-backed Camaroptera	opportunistic	0	0	5	0	0	0	0	0
Prinia subflava Tawny-flanked Prinia	opportunistic	0	9	0	2	0	0	8	3
Platysteiridae									
Batis senegalensis Senegal Batis	opportunistic	0	0	0	0	0	0	0	2

Monarchidae									
Elminia longicauda Blue Flycatcher	opportunistic*	0	0	1	0	0	0	0	0
Terpsiphone viridis Paradise Flycatcher	opportunistic*	0	0	0	0	0	0	0	3
Timaliidae									
Turdoides plebejus Brown Babbler	opportunistic	0	0	13	0	0	0	1	0
Remizidae									
Anthoscopus parvulus Yellow Penduline Tit	opportunistic	0	0	0	0	0	0	0	1
Nectariniidae									
Chalcomitra senegalensis Scarlet-chested Sunbird	opportunistic	4	1	27	3	0	0	15	0
Nectarinia venusta Variable Sunbird	opportunistic	0	0	1	1	0	0	0	0
Zosteropidae									
Zosterops senegalensis Yellow White-eye	partial	0	4	12	2	0	6	22	4
Sturnidae									
Onychognathus morio Neumann's Starling	obligate	15	0	1	0	0	0	0	0
Lamprotornis purpureus Purple Glossy Starling	obligate	0	0	183	0	1	40	61	0
Cinnyricinclus leucogaster Violet-backed Starling	obligate	0	0	25	0	0	0	0	0
Passeridae									
Passer griseus Grey-headed Sparrow	opportunistic	0	0	0	0	0	0	0	1
Ploceidae									
Ploceus heuglini Heuglin's Masked Weaver	opportunistic	0	0	1	0	0	0	0	0
P. cucullatus Village Weaver	opportunistic	9	0	0	4	0	0	87	0
Estrildidae									
Estrilda caerulescens Lavender Waxbill	opportunistic†	31	0	24	1	9	3	1	0
Lagonosticta sanguinodorsalis Rock Firefinch	opportunistic†	0	0	1	0	0	1	0	0
L. senegala Red-billed Firefinch	opportunistic†	0	0	0	0	0	0	0	1
Total visits		**395**	**296**	**1665**	**120**	**23**	**236**	**424**	**75**
Number of species visiting		**19**	**15**	**38**	**14**	**5**	**17**	**18**	**17**

Table 2. Summary of *Ficus* species visited by birds during the study period. Fig sizes (mm) are reported as mean syconium length (first value) and width (second value). Habitat types: SW = savanna woodland; GF = gallery forest; RO = rocky outcrop.

Ficus species	Fig size in mm (n)	Habitat types	Total visits per tree	Time spent per visit (min.)	n figs eaten per visit
abutilifolia	22.9 x 12.1 (44)	SW	395	9.1 ± 10.9	3.9 ± 5.2
ingens	5.0 x 4.5 (30)	SW	296	20.5 ± 19.2	4.8 ± 3.9
lutea	23.1 x 21.7 (80)	GF, SW	416.25*	12.2 ± 26.0	3.6 ± 5.5
ovata	27.5 x 28.8 (15)	RO	120	15.5 ± 31.7	2.3 ± 1.7
platyphylla	14.0 x 13.1 (16)	RO	23	2.9 ± 1.8	1.7 ± 1.1
sp. indet.	20.1 x 18.2 (30)	RO	236	6.3 ± 5.6	3.9 ± 5.5
sycomorus	38.5 x 36.1 (23)	RO, SW	212*	15.2 ± 17.0	2.9 ± 2.4
thonningii	8.3 x 6.5 (40)	RO	75	7.4 ± 5.8	5.2 ± 4.4

*Means of the visit numbers to the four *F. lutea* (826, 229, 302, 308 visits) and two *F. sycomorus* (29, 395 visits) trees observed: sample sizes for behavioural measures are the "total visits" column, except for *F. lutea* (n = 1665) and *F. sycomorus* (n = 424).

We found no strong correlation between mean number of figs consumed per visit and fig size (maximum dimension) ($r = -0.48$, $P = 0.23$, n = 8), although the two species with the smallest figs, *F. ingens* and *F. thonningii*, had the greatest mean number of figs eaten per visit (Table 2). There was also no significant correlation between the number of bird species that visited a tree and fig size, nor between total number of visits to a tree and fig size.

There was a general similarity in the daily pattern of use of the eight fig tree species by birds (Fig. 3), with most feeding activity occurring from 6h30 to 10h00 and the morning peak falling roughly between 8h00 and 9h30 (a little later in *F. platyphylla*). No visitors were seen on trees between noon and 13h00. There was a lesser period of activity from around 14h00 to 18h00, with its peak around 16h00 (Fig. 3).

The mean time spent per visit on each tree was similar among the four individuals of *Ficus lutea* (Tukey HSD test: $P > 0.05$; Fig. 4), but the numbers of visits by birds of different species and mean figs eaten per visit differed significantly between the four trees, in four and five of the six pairwise combinations, respectively (Tukey HSD tests, both $P < 0.05$; Fig. 4).

There was a strong correlation between mean length of visit and mean number of figs eaten per visit at each fig species ($r = 0.57$, $P < 0.001$, n = 8) and significant but weaker positive relationships between number of visits and mean number of figs eaten per visit ($r = 0.17$, $P < 0.001$, n = 8) and between number of visits and mean duration of the visit ($r = 0.12$, $P < 0.001$, n = 8).

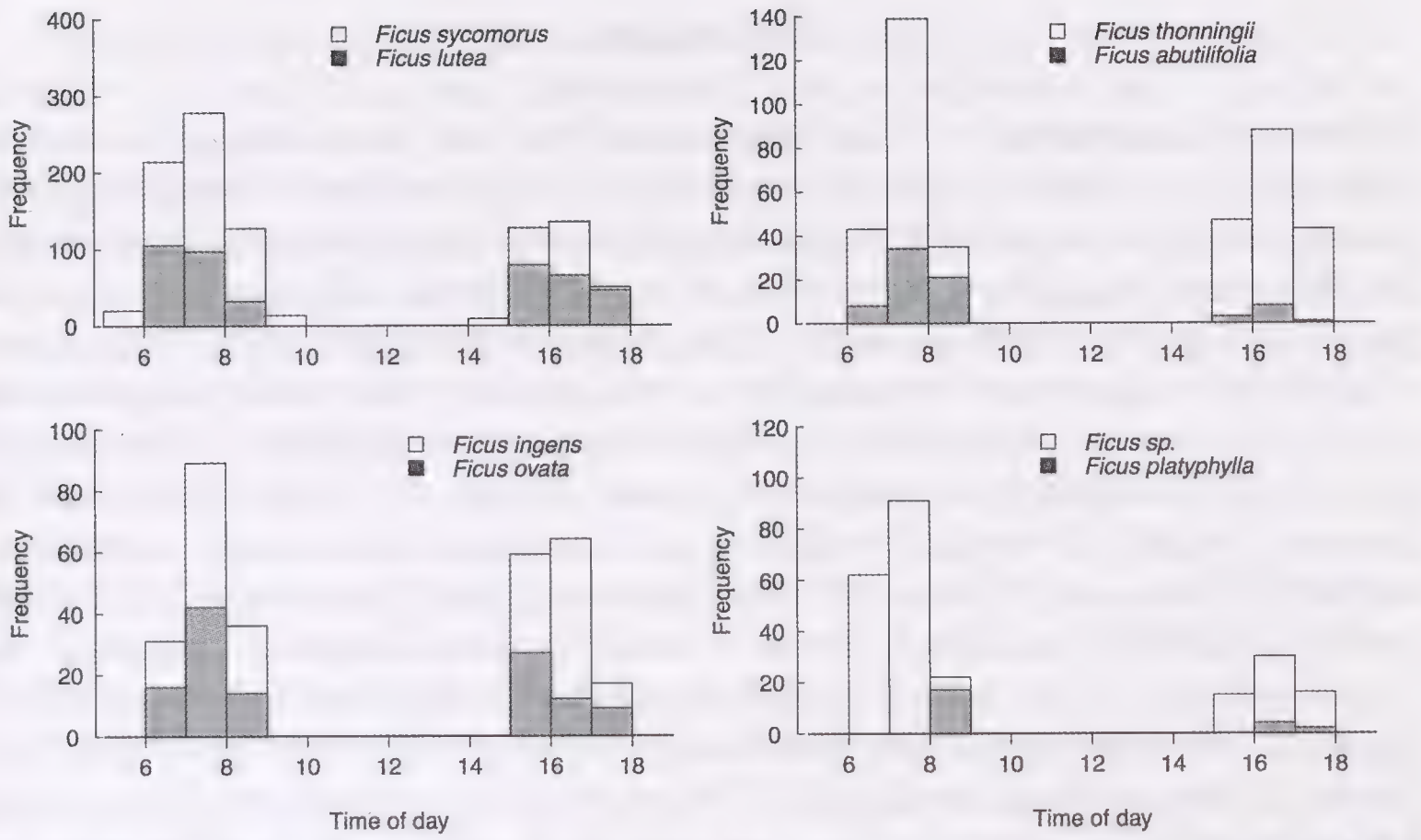

Figure 3. Daily feeding patterns on eight *Ficus* species, as the frequency of bird visits for every hour of the day. Grey bars signify overlap between black and white.

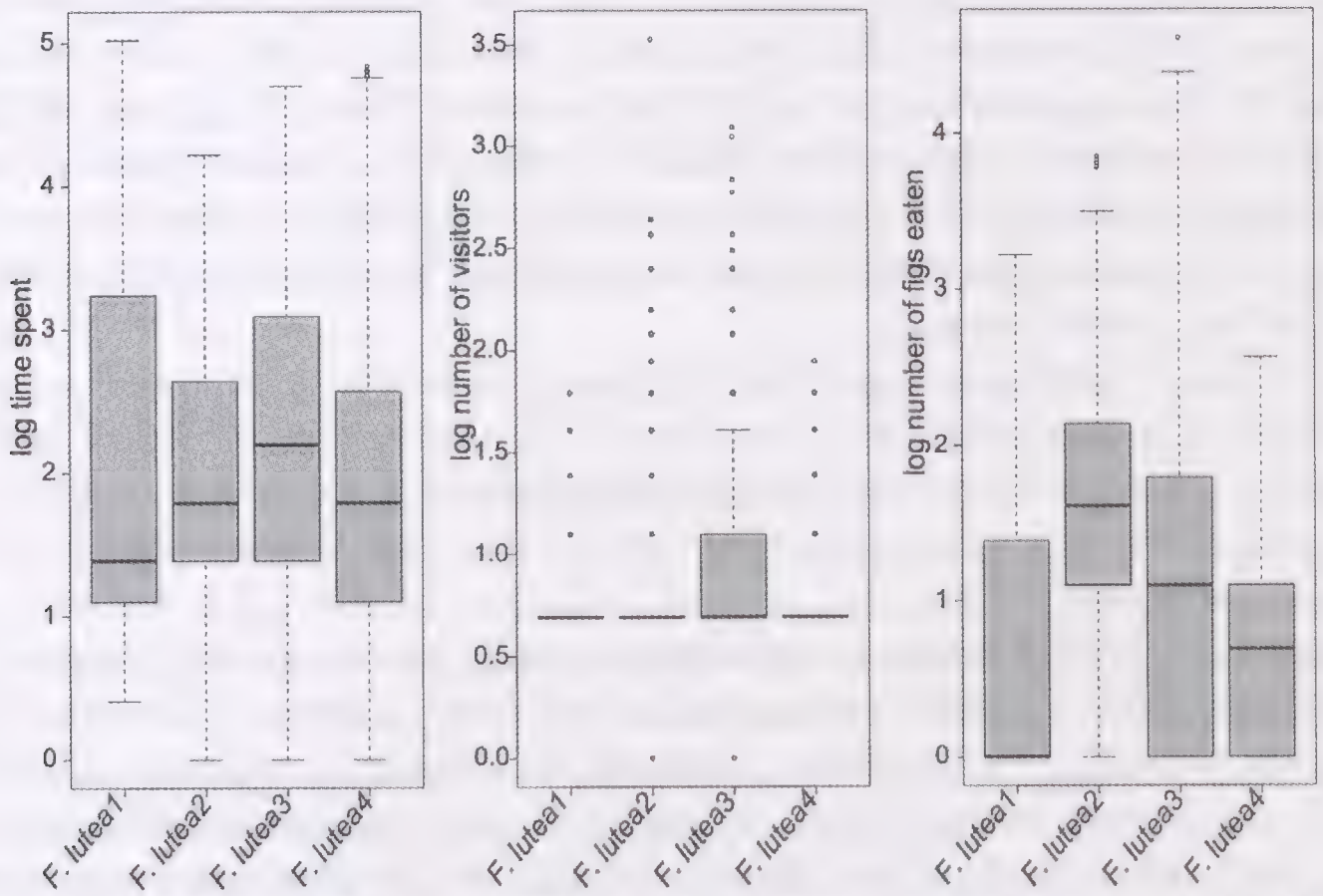

Figure 4. Intra-specific differences in visitation pattern between individuals of *Ficus lutea*. The box ends mark the first and third quartiles, the median is indicated by the horizontal line, the range by the vertical dashed line, and outliers (points > 1.5 x the interquartile range) by circles. Data points on central graph are numbers of visitors of different bird species, whereas all species are grouped for visit times (left) and number of figs eaten (right).

Discussion

Differential attractiveness of *Ficus* species has previously been reported for African frugivores: for example, Bruce's Green Pigeon was said to favour *Ficus platyphylla* (Morel *et al.* 1986), although in the present study it was not noted on *F. platyphylla* but fed almost exclusively on *F. lutea*. Plant species that attract a diverse community of frugivores may similarly be important for frugivore survival (Peres 2000). The relationships observed in our study between birds and fig trees may reflect bird preferences for certain *Ficus* species. For example, *F. lutea* was the most visited fig species (per tree), in terms of both number of bird species and number of visits. The longest visit durations were on *F. ingens*, *F. ovata*, *F. sycomorus* and *F. lutea*, and the most fruits eaten per visit on *F. thonningii*, *F. ingens*, *F. abutilifolia* and *F.* sp., respectively. Of the three most abundant fig species in Amurum, *F. lutea*, *F. abutilifolia* and *F. thonningii*, the former two received the most visits per tree, whereas *F thonningii* received relatively few visits although its small fruits had the highest removal rate (mean figs removed per mean visit time) of all species (Table 2). The somewhat scarce *F. ingens* received many long visits but showed relatively low levels of fruit removal than more common species. Hence, the drivers of consumption are likely to be factors other than tree density.

Factors driving the usage of a particular fig species might include tree density, fruiting phenology, fig colour, fig nutritive value and fig size (Korine & Kalko 2000, Githiru *et al.* 2002, Herrera 2002, Bleher *et al.* 2003, Lord 2004). There was great variation in fig size between the eight *Ficus* species (Table 2; *cf.* Berg & Wiebes 1992), which could account for some of the variation in fig species attractiveness. But although species with small fruits are presumably accessible to a larger range of bird species, we found no significant relationships between fig size and visit frequency or number of bird species visiting.

For *F. lutea*, there were significant differences between the four trees in number of visitors and mean number of figs eaten per visit, although the numerical difference in the latter was slight. These intra-species differences indicate that the conclusions on interspecific differences below, based on only a single tree for most species, must be treated as preliminary.

There was a general similarity in temporal feeding patterns on all fig species, with heavy activity in the morning, except that activity on *F. platyphylla* occurred slightly later in the morning (but not in the afternoon) compared to other fig species. One possible reason could be that frugivores prefer the other species and later move onto *F. platyphylla* when the fruits that ripened overnight on the other species are depleted. Supporting this, *F. platyphylla* had a low number of birds visiting, and the lowest rate of fruit removal. As such, *F. platyphylla* may represent a "backup resource" relative to more preferred species. Choice tests could examine this possibility. The overall pattern of greatest visitation before 10h00 conforms to a common pattern of avian foraging and Breitwisch's (1983) finding at a *Ficus* in Cameroon.

Visitation in the morning was nearly three times higher to *F. thonningii* than to all other tree species, with a peak slightly later than all other trees except *F. platyphylla*; in the evening, the latter part of the afternoon peak in visitation to *F. thonningii* occurred when bird activities started declining on other fig trees (Fig. 3). *F. thonningii* appears to be an important food resource in Amurum; it is found at high density, and although visit times are relatively short, the heavy morning usage pattern and high fruit removal rates (with no figs dropped) suggest it is a preferred food for frugivorous birds. Bleher *et al.* (2003) found that *F. thonningii* provided the most reliable resources for birds in Oribi Gorge Nature Reserve in South Africa.

Our *Ficus* trees were utilized by some opportunistic frugivores which foraged for insects but were not seen to consume figs (Red-throated Bee-eater, Blue Flycatcher, Paradise Flycatcher). Additionally, a number of birds used focal trees for perching but not feeding at all, *e.g.* Hamerkop, Lanner Falcon, Lavender Waxbill, Red-billed Firefinch, and the Nigerian endemic Rock Firefinch.

Overall, our data on *Ficus*–bird associations show that figs are important resources for frugivorous birds in Amurum Forest Reserve. *Ficus lutea*, *F. ingens*, *F. thonningii* and *F. abutilifolia* in particular appear to be the most important fig resources for birds, though we remain cautious in this conclusion because our sample size was limited. The site harbours a high density of fig trees of a variety of species that are used by a large and diverse assemblage of visitors. Longer-term research should focus on the reproductive phenology as well as temporal and spatial availability of figs. This will help identify critical resources and potential keystone species that will inform conservation planning. Reforestation programs should not only consider species rarity and vulnerability but also give priority to plant species that are especially useful in sustaining bird diversity and ultimately ecosystem stability.

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The first photographic evidence for Great Skua *Stercorarius skua* in The Gambia, and the occurrence of large *Stercorarius* species in West Africa

by Oliver J.L. Fox[1], Clive R. Barlow[2], Jamanti Badgie[3] & Lamin Sanyang[3]

[1]Clock House, Coleshill, Swindon, Wiltshire SN6 7PT, U.K.
[2]Correspondence: Birds of The Gambia, Brusubi Gardens, Western Region, The Gambia. <birdsofthegambia@hotmail.com>
[3]Department of Parks & Wildlife Management, Abuko HQ, Western Region, The Gambia

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Summary

On 30 Nov 2014, we observed and photographed a Great Skua *Stercorarius skua* on the Bijol Islands, Tanji Bird Reserve (13°23′7.8″N, 16°48′49.3″W), off Tanji on the west coast of The Gambia. This observation represents the first record with photographic evidence for *S. skua* in The Gambia, although earlier records exist that are attributed to this taxon. We summarise West African sightings of large skuas from onshore sea-watches, pelagic surveys, specimens and ringing recoveries. Large skuas are rare close to the shore in The Gambia, although passage migrants and winter visitors are likely to occur in the upwelling zone at the continental shelf edge further offshore.

Résumé

La première preuve photographique du Grand Labbe *Stercorarius skua* en Gambie, et la présence des grandes espèces de *Stercorarius* en Afrique de l'Ouest. Le 30 nov 2014, nous avons observé et photographié un Grand Labbe *Stercorarius skua* sur les Îles Bijol, Réserve d'Oiseaux de Tanji (13°23′7.8″N, 16°48′49.3″W), au large de Tanji sur la côte ouest de La Gambie. Cette observation est la première avec une preuve photographique pour *S. skua* en Gambie, bien qu'il existe des observations antérieures qui ont été attribuées à ce taxon. Nous récapitulons les observations ouest-africaines de grands skuas à partir du rivage, des enquêtes en zone pélagique, des récupérations de spécimens et de bagues. Les grands skuas sont rares à proximité du rivage en Gambie, bien qu'il puisse se trouver des migrateurs de passage et des visiteurs passant l'hiver dans la zone d'upwelling au large, à la limite du plateau continental.

Observations

On 30 Nov 2014, between 8h50 and 10h50, we observed and photographed a large skua on a beach on the Bijol Islands, Tanji Bird Reserve (13°23′7.8″N, 16°48′49.3″W), 2.5 km off of Tanji on the west coast of The Gambia. We disembarked on the islands at 8h30, to coincide with low tide, and soon spotted the skua on the shoreline. The bird was approachable and allowed close assessment of the diagnostic features (Figs 1, 2): heavy, barrel-shaped body with short tail and broad wings; thick head and neck with contrasting dark cap and golden-streaked neck or hackles; overall dark plumage streaked with lighter, buff highlights; strong, black beak. Although the remiges were in moult (Fig. 2), the large white patches at the base of the primaries were easily visible on the upper- and under-wing. The golden-streaked plumage of the bird and prominent white wing patch are characteristic of older individuals rather than a first-year bird, even though the underparts were lighter brown than the rest of the body. However, separation of sub-adult individuals is complicated in this group of species due to the variability in the extent of pale streaking and blotching and the range of colour morphs. The four longest primaries (P7–10, and presumably the outer primary P11) were unmoulted and some inner primaries were visibly darker and fresher (Fig. 2).

The skua seemed reluctant to fly far or out to sea, instead flying low over the bare rocky reef when disturbed and alighting on the sand on the seaboard side of the islands, and this may be an indication of its health and feather condition. Also found on the islands during the visit were various remains that could be evidence of feeding

Figure 1. Great Skua *Stercorarius skua* on the Bijol Islands, The Gambia, 30 Nov 2014 (Photo: OJLF).

Figure 2. Great Skua *Stercorarius skua* on the Bijol Islands, The Gambia, 30 Nov 2014, showing upper and under wing surfaces, underparts and upperparts (Photos: OJLF).

by the skua: the decapitated head of a Royal Tern *Sterna maxima*, the wing of a Grey-headed Gull *Larus cirrocephalus*, and the remains of a Whimbrel *Numenius phaeopus*. Although intact dead seabirds are commonplace on the Bijol Islands, these fresh fleshy parts are unusual finds at this site where no other carnivorous predators are usually present (CRB pers. obs.).

Discussion

The Bijol bird

There is the possibility for confusion of *S. skua* with South Polar Skua *S. maccormicki* and taxa from the Brown Skua complex *S. antarcticus* (Furness 1987). Identification and ageing of the large *Stercorarius* species is complicated by the highly variable appearance of the various forms and their almost exclusively pelagic habits between juvenile and breeding adult plumages (Cramp 1983, Ainley *et al*. 1990). The migration of a range of similar taxa and perhaps hybrids to the north Atlantic exacerbates the identification challenges encountered with large skuas in West African coastal waters.

S. maccormicki are generally slightly smaller, greyer and more slender than *S. skua* with smaller head and narrower wings. The plumage is usually unstreaked, greyish-brown in the dark morph, pale brown in the intermediate morph and pale-buff in the distinctive, pale morph. They have a paler nape contrasting with the upperparts but not the dark cap seen in adult *S. skua* (Spellerberg 1970, Devillers 1977). Despite this, some first-year *S. skua* individuals closely resemble *S. maccormicki* (Lansdown 1993). *S. antarcticus* are highly variable between subspecies, from pale to dark-brown ground colour and with different amounts of pale streaking. They do not have the dark cap of *S. skua* but typically have a darker underwing (Urban *et al*. 1986, Furness 1996).

The well-streaked individual observed on the Bijol Islands does not correspond to any colour phase of *S. maccormicki*, exhibiting instead the dark cap, golden-streaked nape and reddish-brown underparts characteristic of adult or near-adult *S. skua*. Juvenile *S. skua* are darker and more uniform so can also be discounted (Urban *et al*. 1986, Furness 1996, Svensson *et al*. 2009).

As the breeding seasons of *Stercorarius* species in the northern and southern hemispheres can differ by up to six months, the birds tend to moult at different times of year (Eigenhuis 1987, Baker 1993, Newell *et al*. 2013). Adult *S. skua* undergo complete post-breeding moult during a prolonged period beginning between August to early October and ending between January and mid-March to April. Juvenile *S. skua* have a post-juvenile body moult between December and March and replace remiges between March–April and June to late August (Cramp 1983, Olsen & Larsson 1997). Unlike the slow moult seen in *S. skua*, *S. maccormicki* is said to have a rapid moult of the remiges (taking 45–60 days compared to 150–180 in *S. skua*) during the northern summer, often replacing three or four flight feathers simultaneously (Eigenhuis 1987, Olsen & Larsson 1997).

It is possible to determine an approximate primary moult score for the Bijol Islands bird from the images of the bird in flight (Fig. 2). Five unmoulted primaries and others not fully grown, gives a moult score of *c.* 20. Relating primary moult score to timing of moult (Newell *et al*. 2013), we infer that a moult score of 20 in late November likely corresponds to either first-cycle *S. maccormicki* or near-adult to adult *S. skua*. As the plumage characteristics rule out *S. maccormicki*, the moult pattern supports the identification of the Bijol bird as *S. skua*.

This is the first photographic evidence for the occurrence of *S. skua* in The Gambia, although passage migrants and winter visitors are likely to occur regularly off the coast and are often recorded off northern Senegal between July and February (Barlow *et al.* 1997, Borrow & Demey 2011).

The Bijol bird appeared to be in poor condition, with the tail worn. Great Skuas rarely come ashore during the winter months, which also suggests that this individual was in poor health. Predation of terns and gulls is to be expected, with Great Skuas often taking species of this size (Urban *et al.* 1986, Furness 1987).

Previous records of *S. skua* in The Gambia

There appear to be only two previous observations of *S. skua* in the country, both so far undocumented. The first was observed by CRB during the rainy season in 1996, along the Atlantic Hotel beachfront in Banjul (13°27′38.2″N, 16°34′40.6″W). It was a large brown skua with broad wings and prominent white wing patches, seen without binoculars, a few hours after a heavy storm. The second record was on the Bijol Islands, 30 Jan 2003 (Demey 2004), when a skua was observed on the eastern side of the islands for *c.* 2 min at *c.* 11h30, just before low tide, before it flew off; it was later seen together with a Pomarine Skua *S. pomarinus* harrying a Grey-headed Gull. The observers were confident that the bird did not fit the description of *S. maccormicki* (D. McCabe pers. comm.). Recently, another *S. skua* was seen from a boat travelling between Tanji and the Bijol Islands on 12 Jan 2015 (F. Stoekenbroek pers. comm.).

Status of large *Stercorarius* species in West Africa

S. skua migrates from its breeding grounds in the northeast Atlantic, dispersing southwards off Europe and northwest Africa, rarely as far as the Equator (Furness 1987, 2002). Adults typically migrate shorter distances, to areas such as the Bay of Biscay, and return to the same breeding territory each year (Klomp & Furness 1992). Immature birds often wander further than adults, providing ringing recoveries in North and South America, West Africa, Greenland and northern Russia (Furness 2002). *S. skua* breeding in Iceland, Scotland and Norway show varied migration strategies: those breeding in Shetland wintered in waters off southern Europe and northwest Africa, whereas adults from Iceland wintered mainly off Canada (Magnúsdóttir 2012, Magnúsdóttir *et al.* 2012). Away from the breeding grounds, skuas avoid land, staying at least 2 km from the coast. Therefore, higher numbers are observed on pelagic surveys than from coastal sea-watches, unless weather conditions push them towards the shore (Furness 1996). During winter, usually only sick or incapacitated birds are seen on land and this could be the case with the bird photographed on the Bijol Islands.

S. maccormicki and *S. antarcticus* range north from their breeding sites during the austral winter (Devillers 1977, Phillips *et al.* 2007), dispersing widely across the Atlantic and Southern Oceans. Ringing recoveries of *S. maccormicki*, and specimens identified as this species, have been taken along the west Atlantic coastline from Greenland to

Brazil and on the Pacific coast of North America (Devillers 1977, Bourne & Curtis 1994). This species moves into the northern hemisphere probably on clockwise loop migrations and is common off Newfoundland between May and August (Bourne & Lee 1994, Furness 1996). A skua identified as *S. maccormicki* on the basis of morphology and moult was observed off La Palma, Canary Islands, Oct 2005 (Winkel 2009).

A number of records initially attributed to *S. antarcticus* north of the Equator have been shown either to be erroneous or to refer to *S. maccormicki* (Devillers 1977, Votier *et al*. 2004, 2007). Tracked individuals of *S. antarcticus* from South Georgia and the Falkland Islands wintered solely in the Southern Oceans (Phillips *et al*. 2007) and it seems likely that *S. antarcticus* winters much further south than *S. maccormicki*.

Observations of *S. skua* in northwest and West African waters are summarised in Table 1. Further south, *S. skua* records become increasingly rare, with sporadic recoveries

Table 1. Records of Great Skua *Stercorarius skua* in northwest and West Africa.

Country	Status
Morocco	Uncommon to rare passage migrant and winter visitor (Thévenot *et al*. 2003).
	Regular winter visitor, especially offshore (I. Cherkaoui pers. comm.).
Canary Islands	Scarce but regular passage migrant and winter visitor (Clarke 2006).
Mauritania	Regular on pelagic surveys across the continental shelf break (Camphuysen & Meer 2005).
	Peak numbers between Aug–Sep and Apr. Small numbers regular in coastal waters (Isenmann *et al*. 2010).
	Onshore records of sick or exhausted birds (W. Mullié pers. comm.).
Cape Verde	Nine records but probably more common offshore (Clarke 2006).
	Regular sightings of *S. skua* and several unidentified, either *S. skua* or *S. maccormicki* (Hazevoet 2014).
Senegal	During winter, rare (Dupuy 1984); four records (Morel & Morel 1990).
	On sea-watches from Cap Vert: one, Oct 1990, four, Jul–Sep 1991, three, Apr 1992 (Baillon & Dubois 1992); three, Oct 1994 (Allport 1995).
	Many large skuas (*S. skua/maccormicki*) observed from Cap Vert (160 in Oct 1995; 198 in 1996; 140 in 1997 (Marr et al. 1998); 213 in 2001, 353 in 2003, 171 in 2005, 762 in 2007 and 47 in 2008 (Dubois et al. 2009)), including groups of birds heading south in the northern autumn which were proposed to be migrating *S. maccormicki* (Newell et al. 1997, Dubois et al. 2009), corresponding to its clockwise migration (see text).
	Regular at sea off Dakar (W. Mullié pers. comm.).
The Gambia	The four records described in this paper.
Guinea-Bissau	One in 2011 (Table 2); no other recent records (P. Catry pers. comm.).

and records from Liberia, Ghana and Annobón (Borrow & Demey 2001), Côte d'Ivoire (Table 2), and Nigeria (one offshore record in 1996: P. Hall, pers. comm.). Some of these records may refer to *S. maccormicki* (Borrow & Demey 2001).

A small number of *S. skua* ringed in the U.K. (mainly at Foula, Shetland) have been recovered, mostly found dead or dying, in West Africa (Table 2), with only two south of Senegambia. While this can be partly attributed to the sparsely inhabited African coastline and low reporting rates there, it also reflects the decreasing abundance of *S. skua* southwards along the West African coast. Many of the recoveries are of first-year birds, which disperse further.

Table 2. Recoveries in northwest & West Africa of Great Skuas *Stercorarius skua* ringed as nestlings and adults, from <http://www.bto.org/ringing-report> generated 30 May 2014. Period is that between ringing and recovery.

Country	Number and details of recoveries
Morocco	45 recoveries
Canary Islands	3: nestlings, 1 month, 5 months, 6 months
Western Sahara	3: nestlings, 18 months, 64 months; adult 17 months
Mauritania	1: nestling, 42 months
Cape Verde	2: nestlings, 7 months, 56 months
Senegal	4: nestlings, 6 months, 10 months, 56 months; adult, 129 months
The Gambia	0
Guinea-Bissau	1: nestling, 235 months
Côte d'Ivoire	1: nestling, 11 months

The upwelling zone at the continental shelf edge off West Africa marks the meeting of cool, upwelled waters from the abyssal plain and warm, offshore waters. The mixing zone supports a high density of shoaling pelagic fish, attracting many seabirds and fishing vessels (Wynn & Knefelkamp 2004, Wynn & Krastel 2012). Many *Stercorarius* species are most abundant in this region and relatively scarce over the deep ocean (Furness 2002, Camphuysen & Meer 2005). While the smaller Arctic Skua *S. parasiticus* and Pomarine Skua *S. pomarinus* regularly come closer to the shore and can be numerous in the mouth of the Gambia River, *S. skua* is much rarer inshore.

Off Morocco, Western Sahara and Mauritania, *S. skua* is considered a regular migrant, often encountered on pelagic expeditions (Thévenot *et al.* 2003, Wynn & Knefelkamp 2004, Isenmann *et al.* 2010). Geolocator studies suggest that this population is increasing, perhaps benefitting from refuse from the flourishing commercial fishing industry (Magnúsdóttir *et al.* 2012). If this is the case then sightings further south may increase in future. None of the tracked adults travelled further south than Dakar, Senegal.

In Senegal, around Dakar, the continental shelf break lies close to the coast (*c.* 5 km) where the Cap Vert peninsula extends 50 km into the Atlantic Ocean. Sea-watching from Point des Almadies and Ile Ngor, at the northwestern tip of the cape, yields many seabird sightings due to the close proximity of the upwelling zone and the concentration by the peninsula of north–south passage migrants. Sightings of *S. skua* or other large skuas are still few in comparison with the hundreds of *S. parasiticus* and *S. pomarinus* recorded (Baillon & Dubois 1992, Allport 1995, Dubois *et al*. 2009).

South of Dakar the continental shelf edge is further offshore: *c.* 75 km off The Gambia. As such, the numbers of pelagic species encountered near land are reduced. Surveys in the offshore upwelling zone during the autumn and winter are needed to discover whether the large skuas are as abundant west of The Gambia as they are off northern Senegal and Mauritania.

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Our observations were made while conducting a survey with the Gambian Department of Parks and Wildlife Management Osprey Survey Group, supported by the Leicestershire and Rutland Wildlife Trust and Tim Mackrill. Klaus Malling Olsen, Bob Furness and Stephen Votier generously commented on the specific identity of the Bijol skua. Mr Lamin Gassama (Director of the Department of Parks and Wildlife Management) and his Research and Development Unit are acknowledged for allowing access to the Bijol Islands, Tanji Bird Reserve. Details of additional skua sightings in The Gambia were gratefully received from Dermot McCabe and Frits Stoekenbroek. Paulo Catry, Wim Mullié, Phil Hall and Kees Camphuysen kindly summarised the status of large skuas elsewhere in West Africa, and Tim Dodman provided some literature.

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Short Notes — Notes Courtes

Clarification: Black-bellied Seedcracker *Pyrenestes ostrinus* specimens from the Ivory Coast include males

There has been considerable confusion in the literature about the identity of seedcrackers (genus *Pyrenestes*) in the Ivory Coast. This stems, in part, from the difficulty of identifying females and the lack of hard evidence (such as specimens or published photographs) of male Black-bellied Seedcracker *P. ostrinus* from the country, despite several published records (Borrow 2000, Yaokokoré-Béibro 2010, Yaokokoré-Béibro *et al.* 2010, Kouadio *et al.* 2014). The result has been that *P. ostrinus* has not been included in any checklists of birds of the Ivory Coast (most recently Dowsett *et al.* <www.africanbirdclub.org/countries/checklists/downloads> consulted 27 Mar 2014). In our recent article (Engel *et al.* 2014), we discussed the discovery of four specimens of this taxon in the Field Museum of Natural History collection, from the southeast of the Ivory Coast, but we neglected to mention the sex of the birds or include a photograph. We remedy this here by providing a photograph of the four specimens (Fig. 1), two males, one female and one unsexed, which were collected by D. Parelius in Port Bouet (5°19′N, 4°1′W) in the outskirts of Abidjan, in March 1967.

We thank R.J. Dowsett for pointing out the need for this clarification.

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Figure 1. Specimens of Black-bellied Seedcracker *Pyrenestes ostrinus* from the Ivory Coast (left to right, FMNH 281917–281920). The two on the left are males, second from right is unsexed, rightmost is female.

Joshua I. ENGEL[1,2], Daniel PARELIUS[3] & John M. BATES[1]
[1]Field Museum of Natural History, Integrative Research Center,
1400 South Lake Shore Drive, Chicago, Illinois 60605, U.S.A.
[2]Correspondence <jengel2@fieldmuseum.org>
[3]427 Bakers Branch Road, Louisa, Virginia 23093, U.S.A.

Pomarine Skua *Stercorarius pomarinus* kills Red-billed Quelea *Quelea quelea* at sea

Figure 1. Pomarine Skua *Stercorarius pomarinus* chasing, capturing and drowning Red-billed Quelea *Quelea quelea* at sea, with upper inset showing wing moult of the quelea. Images © Wim C. Mullié and Julien Semelin.

During a pelagic trip off Dakar, Senegal, at 12h42 on 10 Dec 2014, a Red-billed Quelea *Quelea quelea* was seen flying over the sea at 14.64982°N, 17.53460°W, *c.* 7.5 km from the nearest coast. The bird landed on the boat, where it tried to hide in a tyre attached to the railing. Within a minute it took off again and was immediately spotted by three Pomarine Skuas *Stercorarius pomarinus*, two of which pursued the quelea until 12h45 when it was eventually forced by one of them to the sea surface, captured, drowned and probably swallowed whole, as the skua flew off 4 s later without visible prey (Fig. 1).

The Red-billed Quelea is a *c.* 20 g highly gregarious terrestrial passerine that normally does not venture over sea (Bruggers & Elliott 1989, Fry & Keith 2004). This bird was in full wing moult with a primary score of 27 out of 45 (555543000) and the 2nd secondary half grown (Fig. 1), perhaps reducing its ability to evade predators. Pomarine Skuas are primarily piscivorous in their wintering habitats (Baltz & Morejohn 1977), but they also kleptoparasitise and kill other birds, including waders and other seabirds (Oordt 1940, Cramp & Simmons 1983, Camphuysen 1992) but only occasionally passerines (Glutz von Blotzheim & Bauer 1982). Woollard (1975) mentions a Starling *Sturnus vulgaris* that was separated from a flock at the coast of Kent, U.K., by a Pomarine Skua, forced into the sea and eaten, seemingly in a similar way to how the quelea was killed. Drowning is also mentioned by Glutz von Blotzheim & Bauer (1982) and may be the usual way that Pomarine Skuas kill bird prey at sea.

We are not aware of any other records of predation of quelea at sea (*cf.* Fry & Keith 2004). The only published evidence of Red-billed Quelea seen over the sea is Oschadleus (2009), but they are frequently seen in coastal Gambia, Senegal and Mauritania, including along beaches and in the city of Dakar (WCM *pers. obs.*). The closest of the Cape Verde Islands is *c.* 570 km from Dakar, but quelea have not been recorded there (Hazevoet 1995).

We thank Peter Jones and Clive Elliott for drawing our attention to the moult score, Dieter Oschadleus for checking the literature for marine records of predation of quelea, and Bob Cheke and Clive Barlow for their comments on an earlier draft.

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Wim C. Mullié[1], C.J. (Kees) Camphuysen[2] & Julien Semelin[3]
[1]Programme Biodiversité, Gaz, Pétrole, GIZ, BP 5217, Nouakchott, Mauritania
<wim_sen@yahoo.fr>
[2]NIOZ Koninklijk Nederlands Instituut voor Zeeonderzoek, The Netherlands
[3]MAVA Foundation, Rue Mauverney 28, 1196 Gland, Switzerland

Quail-plover *Ortyxelos meiffrenii* and Little Crake *Porzana parva* in Burkina Faso

***Ortyxelos meiffrenii* Quail-plover.** Van den Bergh (2013) presented a photograph of this species from between Sebba and Tankougounadié (*c.* 13°28'N, 0°35'E) as the first proof of its occurrence in Burkina Faso, and referred to the map in Borrow & Demey (2004) indicating its presence in the north-east of the country. This was based on Balança & de Visscher (1997), who had reported eight observations in the far north, at Kaïn (14°3′N, 2°45′W) and Solé (14°8′N, 2°6′W).
***Porzana parva* Little Crake.** The sighting of two (one of them calling) from 23 February to 1 March at a site between Bousse and Lanfiera, 13°3′N, 3°27′W (van den Bergh 2013) is not the first for Burkina Faso, but an interesting addition to the few West African records of this Palaearctic migrant. Weesie (1996) had mentioned two at Dori (14°2′N, 0°2′W) in January 1991, and in December 1991 or January 1992, while Balança & de Visscher (1997) captured one at Ouahigouya (13°35′N, 2°25′W) on 5 February 1994.

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Robert J. DOWSETT
Le Pouget, Sumène 30440, France <Dowsett@aol.com>

Reviews — Revues

Birds of Western Africa (2nd ed. of *Field Guide to the Birds of Western Africa*), by Nik Borrow & Ron Demey (2014) 592 pp., 266 col. plates, Bloomsbury, London. ISBN 978-1-4729-0568-0, paperback, £40.

The first edition of this book, entitled *Field Guide to the Birds of Western Africa* (2004) was warmly welcomed by birdwatchers and professional ornithologists in West Africa (*Malimbus* 27: 120–121). That work was itself a condensed version of the larger format handbook by the same authors published in hard covers in 2001 and entitled *Birds of Western Africa*. This change in title of the 2nd edition of the field guide to that of the 1st edition of the handbook will lead to endless citation confusion. Advertisements have also appeared for a second edition of the French version of the 2004 field guide. This, however, concerns a second printing of the first French edition, not a translation of the second, revised English edition.

What else has changed since 2004, and what improvements are there in this new edition? The geographical coverage remains the same, covering all 23 West African countries from Mauritania east to Chad and south to Congo-Brazzaville, and including the Gulf of Guinea and Cape Verde islands. A number of species not previously recorded in West Africa are now included and illustrated.

The most significant changes are that the new edition has almost double the 148 colour plates of the 2004 edition, French bird names are included next to the English names and there is an index to them — extremely helpful for use in francophone countries, and the distribution maps are now more detailed and are included with the text facing the illustrations for each species. As a result the new book runs to 592 pages (compared to 511 in the 2004 paperback) and is consequently a little heavier (1050g versus 905 g). However the greater ease of use in having the maps and text opposite the plates amply compensates for this. I do have a minor quibble in that some of the plates in the review copy appear to be printed rather dark. This is particularly noticeable in comparison to the plates in the 2001 handbook, but they are also slightly darker than those in the 2004 field guide.

The publisher's notes claim an increased number of images per species but the more noticeable difference is that the images are generally larger and the plates less crowded. The disadvantage of this is that on occasion one may need to check several plates rather than one when trying to identify a particular bird, but this is more than compensated by general ease of use. The falcons for example now take up four plates rather than two, including two additional recently recorded species, the Greater Kestrel *Falco rupicoloides* and the Rock Kestrel *F. rupicolus*. Similarly, the bulbuls and nicators now extend to eight plates compared to four in the 2004 edition, and the warblers and cisticolas have 21 plates compared to the previous 11. For the weavers,

the black-and-white illustrations of nests, previously shown on a separate plate, are now included adjacent to the colour illustration of the bird weaving that nest. This is another improvement that will increase ease of use of the guide in the field. This edition also includes a final plate illustrating eight species so far unrecorded in the area covered by the book but which, because of the proximity of their known ranges, might be anticipated to be discovered there.

Taxonomy largely follows the 4th edition of the *Howard & Moore Complete Checklist of the Birds of the World* vol. 1 (E.C. Dickinson & J.V. Remsen, eds, 2013, Aves, Eastbourne) for the non-passerines, while for the passerines the treatment is based on a combination of the *Howard & Moore* 3rd edition (E.C. Dickinson, ed., 2003, Christopher Helm, London), the *Handbook of Birds of the World* vols 8–18 (J. del Hoyo *et al*. 2003–11, Lynx, Barcelona) and the *IOC World Birds List* (F. Gill & D. Donsker, eds, 2014, doi:10.14344/IOC.ML.4.1). As a result, in the hornbills, for example, fewer species are recognised than in the *HBW and Birdlife International Illustrated Checklist of Birds of The World* (J. del Hoyo & N.J. Collar 2014, Lynx, Barcelona). This is not a real problem in a field guide that depicts most of the distinctive subspecies clearly. Even so there are taxonomic changes from the earlier edition, including the splits of Blue-moustached Bee-eater *Merops mentalis* from Blue-headed Bee-eater *M. muelleri*, and of Moltoni's Warbler *Sylvia subalpina* from Subalpine Warbler *S. cantillans*, all now illustrated.

When I first read of the changes to the new edition I thought that these would be insufficient for me to consider buying it. Now I have had the opportunity to compare editions I have no hesitation in recommending that readers consider upgrading to the second. For those who have neither of the earlier works then invest in the new one: it's a fantastic book and I congratulate the authors and contributors for a job well done.

Roger Wilkinson

The Birds of Ghana, by F. Dowsett-Lemaire & R.J. Dowsett (2014) 713 pp., 54 col. plates Tauraco Press, Liège. ISBN2-87225-007-7, paperback, £35.

This masterpiece is by far the most detailed and comprehensive book written to date on the birds recorded in Ghana, and supersedes the similar but now largely outdated work by L.L. Grimes (1987, *The Birds of Ghana*. British Ornithologists' Union, London). As with Grimes (1987), this book contains not just species accounts but also, and to a greater extent than that of Grimes's pioneering work, thorough and precise information on the biology, ecology and conservation of birds in this diverse region of Africa. In addition to extensive archive studies, including unpublished accounts, lists and notes, as well as reviews of published journal articles (of which

only a few recent ones are not listed) and technical reports, the information in this "avian bible" of Ghana is also based on extensive field work over a long period by the two authors, legendary for their many studies and publications on African birds.

This exemplary book provides not only an objective, scientifically rigorous and up-to-date assessment of the distribution and status of 750 species of bird recorded in Ghana, but also includes several informative and useful chapters (nearly 140 pp.) on aspects of geography, biomes and vegetation zones, protected areas, and threats to the conservation of the avifauna and other wildlife in Ghana. It includes a detailed account (15 pp.) on the ornithological history of the country, from the pre-colonial era of the "Gold Coast" some 300 years ago, up to 2013, with a meticulous research bibliography of almost 100 ornithological personalities and institutions from around the world. As such the reader is well informed about many important ecological and socio-economic aspects of the country, before the general ecology, habitat preference, distribution and conservation status of each of the 750 species are carefully described.

Unusually, the systematic list includes distributional maps which, although not giving exact relative abundance or density estimates, are based on accepted historical records as well as 22 months of intensive surveys from over 200 camp sites, during 2004–5 and 2008–11. This survey provided records of 695 bird species in 93 squares of 0.5 x 0.5 degrees, covering the whole of Ghana, and results in some of the most detailed distributional maps for birds compared to any previous published work for West Africa, including Ghana.

Throughout the book the relationship between habitats and their avifauna is thoroughly explained, well-documented and supported by extensive references and identified observers. This approach enables the reader to understand major biogeographical patterns, and how various bird groups (taxonomic and ecological guilds) are adapted to their environments. Another strength of this sophisticated publication is a summary and thorough evaluation (38 pp.) of the current conservation status of habitat types (biomes) and birds within Ghana, assessed from regional as well as global perspectives. This entails a detailed status assessment of the protected area network in Ghana, which lately is subject to immense pressure from human exploitation. Anthropogenic disturbances that are highlighted as major threats to habitats and birds in Ghana include hunting, fishing, logging, mining, dam construction, and agricultural activities causing deforestation and habitat degradation.

Apart from the list of over 510 references, and indices of scientific and English names, there are two comprehensive appendices, of ringing recoveries of Palaearctic migrants and Important Bird Areas and other sites in the country (with coordinates), as well as three useful maps of Ghana illustrating major demographic (administrative zones, regional capitals and other large cities) and topographical features (elevation and drainage), and the protected area network (forest and wildlife reserves). A similarly detailed map of major vegetation zones would have been useful, but surprisingly there is only a map of West Africa showing the three major biomes found in Ghana. Although more colour photos of bird species would have further beautified

this otherwise richly illustrated book, it contains 55 photos, 22 of them of birds, illustrating a variety of typical habitat types and landscapes with examples of their avifauna. The English and scientific nomenclature generally follows the *Howard & Moore Complete Checklist of the Birds of the World* (4th edition, E.C. Dickinson & J.V. Remsen, eds, 2013, vol. 1; E.C. Dickinson & L. Christidis, eds, 2014, vol. 2. Aves, Eastbourne) which is consistent with that used by N. Borrow & R. Demey (2010, *Birds of Ghana*. Christopher Helm, London); although a few genera follow alternative nomenclature, the systematic usage is thoroughly explained in a preceding 6-page section.

Summarising, this excellent volume is indispensable for any Afrotropical bird library or professional ornithologist in Ghana, as well as others with a keen interest in West African birds. Considering its huge amount of data, this book is affordable and highly recommendable for anyone who resides in or visits Ghana and wants to learn more about the diverse habitats and associated avifauna found in this fast-developing, ecotourist-friendly country of West Africa.

Lars H. Holbech

Society Notices — Informations de la Société

Editor's Report for the years 2012–2014

During the past three years, two issues of *Malimbus* have been printed each year as planned. The annual page totals (Table 1) were slightly above the long-term average (since Volume 1) of just under 124.

Table 1. *Malimbus* publication statistics, 2012–2014.

	2012	2013	2014
Number of pages	128	160	124
Scientific papers received	17	12	8
published	15	16	11
rejected or withdrawn	0 (0 %)	1 (8 %)	2 (25 %)
Reviews published	0	1	0
News & Comment (including Corrigenda) published	2	4	2
Society Notices published	6	6	3

The rate of submissions was about average in 2012, but from 2013 submissions have dropped sharply. This has happened before (2003–5, 2009–10), so may not be cause for great concern, although the low rate in 2003–5 resulted in only single issues appearing in two of those years. The proportion of biological and ecological submissions, particularly by West African authors, continues to increase.

All full-length papers and Short Notes were reviewed by two (occasionally one or up to four) referees, in addition to the Editor. Referees are acknowledged in each issue as the "Editorial Board". Two papers were rejected owing to inadequate data and inappropriate analysis; in both cases the authors were encouraged to resubmit if they could take account of major changes requested by referees. One submission was withdrawn by its author pending the incorporation of new information. The proportion rejected or withdrawn (8 %) of those received the same year was similar to that of previous periods. Rejection took place within three weeks of receipt.

All of the 42 scientific papers published, except one Short Note, required revision following review by referees and Editor. The time taken by authors to revise their papers varied from one day to 26 months (median 3.5 months), similar to recent years. Several papers required multiple revisions, with up to seven rounds of transmission between Editor and authors. The delay between receiving a final acceptable version of a paper and its publication was 1–8 months (median 3 months), shorter than in previous years but difficult to reduce further, given our 6-monthly

publication schedule. Altogether, including the time taken for review by referees, editing by me, revision and proof-reading by authors, the delay between first receipt of a scientific submission (*i.e.* not including News, Notices and Reviews, which are always published in the issue immediately following receipt) and its publication was 2–28 months (median 9.5 months), slightly shorter than previously, and with 64 % of papers published within one year of receipt.

I should once again like to express my gratitude to all referees for their precious time and valuable insights, as well as to Joost Brouwer, Peter Browne, Tim Dodman, Ulf Leidén and Nils Robin for their contributions to managing the journal's printing, distribution and mailing list, assisting with translations, and placing copy quickly on the web site.

Alan Tye

Rapport du Rédacteur en chef pour la période 2012–2014

Au cours des trois dernières années, deux numéros de *Malimbus* ont été imprimés par an, comme prévu. Les nombres de pages (Tableau 1) ont été un peu plus élevés que le nombre moyen de pages depuis le Volume 1, légèrement inférieur à 124.

Table 1. Statistiques de publication de *Malimbus* pour 2012–2014.

	2012	2013	2014
Nombre de pages	128	160	124
Articles scientifiques reçus	17	12	8
publiés	15	16	11
refusés ou retirés	0 (0 %)	1 (8 %)	2 (25 %)
Revues publiées	0	1	0
Nouvelles & Commentaires publiées (Errata inclus)	2	4	2
Informations de la Société publiées	6	6	3

Le nombre de soumissions a été proche du moyen en 2012, mais il a nettement chuté depuis 2013. Cela s'était déjà produit auparavant (2003–5, 2009–10) et peut donc ne pas paraître très inquiétant. Cependant, le faible nombre en 2003–5 avait eu pour conséquence la publication d'un seul numéro pendant deux de ces années. La proportion de manuscrits sur la biologie et l'écologie, spécialement par des auteurs d'Afrique de l'Ouest, continue d'augmenter.

Tous les manuscrits longs et les Notes Courtes ont été revus par deux lecteurs (parfois un, ou jusqu'à quatre) en plus du Rédacteur en chef. Les lecteurs sont cités dans chaque numéro à la rubrique Comité de Rédaction. Deux articles furent refusés pour manque de données et analyse inapproprié; dans les deux cas, les auteurs ont été

encouragés à soumettre de nouveau leurs articles s'ils pouvaient tenir compte des importants changements demandés par les lecteurs. Une soumission fut retirée par son auteur dans l'attente d'y incorporer de nouvelles informations. La proportion de manuscrits refusés (8 %) par rapport à ceux reçus la même année a été similaire à celle des années précédentes. Le refus a été notifié dans un délai de trois semaines après la soumission.

Tous les 42 articles scientifiques publiés, à l'exception d'une Note Courte ont nécessité une révision par leurs auteurs, après lecture par les lecteurs et le Rédacteur en chef. Le temps mis par les auteurs pour réviser leurs articles a varié d'un jour à 26 mois (médiane 3,5 mois), comme dans les années récentes. Plusieurs articles ont nécessité des révisions multiples, jusqu'à sept échanges entre le Rédacteur en chef et les auteurs. Le délai entre la réception de la version définitive acceptable d'un manuscrit et sa publication a été de 1–8 mois (médiane 3 mois), inférieur à celui des années précédentes et difficile à réduire davantage, étant donné notre rythme de parution bisannuel. Au total, en prenant en compte le temps pris par les critiques, mes propres corrections, et la révision et les lectures d'épreuves par les auteurs, le délai entre la première réception d'un manuscrit scientifique (c'est à dire non compris les Nouvelles, Informations et Revues, qui sont toujours publiées dans le numéro suivant immédiatement leur réception) et sa publication a varié de deux à 28 mois (médiane 9,5 mois), un peu moins que dans les années antérieures, et avec 64 % des articles publiés dans les 12 mois de leur réception.

Je veux de nouveau remercier tous les lecteurs pour le temps et les avis qu'ils ont généreusement donnés, ainsi que Joost Brouwer, Peter Browne, Tim Dodman, Ulf Leidén et Nils Robin, qui ont contribué à l'impression du journal, à sa distribution, à la tenue de la liste des abonnés, ainsi que pour leur assistance en matière de traductions ou pour en avoir rapidement mis copie sur le site Internet.

Alan Tye

W.A.O.S. membership changes
Changements à la liste d'adhérents de la S.O.O.A.

New and rejoined members — Membres nouveaux ou réinscrits

RAGSDALE, R., 707 NW 6th Ave, Hillsboro, OR 97124, **U.S.A.**

SMALLEY, Dr M.E., 10 Washdyke Lane, Nettleham, Lincoln, Lincs., LN2 2PY, **U.K.**

Resignations and deletions — Renonciations et enlèvements

LAESSER, J.

NESSELROADE, D.

Deaths — Décès

GRÜNEWALD, Dr J.

Address changes and corrections — Changements et corrections d'adresse

BARLOW, C., c/o F. Mendy, POB 4173, Bakau PO, **The Gambia**

GUÉVORTS, B., Rue du Prince de Galles, Akwa, BP 15057 Douala, **Cameroon**

HANDKE, C., Postfach 20 02 02, 13512 Berlin, **Germany**

KISASA KAFUTSHI, Prof. R., 17-1645 rue Mullins, Montréal, Quebec H3K1N3, **Canada**

LACHENAUD, O., 9 Avenue Edouard Kufferath, 1020 Bruxelles, **Belgium**

SCHOLTE, P.T., Nieuwe Teertuinen 12c, 1013 LV Amsterdam, **The Netherlands**

WÜST, R., ZGAP, Faberstr.4, D-70188 Stuttgart, **Germany**

HARVARD LAW SCHOOL, Langdell Hall 152, ERS-MCZ, 1545 Massachusetts Avenue, Cambridge, MA 02138, **U.S.A.** [formerly Ernst Mayr Library, Museum of Comparative Zoology, Harvard University]

Tim Dodman, Treasurer and Membership Secretary

West African Ornithological Society
Société d'Ornithologie de l'Ouest Africain

Revenue Account for the year ended 31 December 2014

Income	**£ Sterling**	**€ Euro**	**Total (£)**	**2013 (£)**
Subscriptions	2068	1034	2877	2543
Interest and donations	0	0	0	90
	2068	1034	2877	2633
Expenditure				
Malimbus production and distribution	3186	0	3186	3314
Bank charges and office costs	0	3	3	3
	3186	3	3188	3317
Surplus/deficit per account for year	–1118	1031	–311	–683

Balance Sheet as at 31 December 2014

Bank balances at 1 January	747	5172	5065	5677
Surplus/deficit for year	–1118	1031	–311	–683
Transfer from Euro to Sterling account	2403	–3000	-	-
Exchange rate gains/losses	-	-	–216	72
Bank balances at 31 December	£2032	€3202	£4538	£5065

Notes

There was a deficit of £311 during 2014, somewhat lower than the deficit of 2013, mainly due to an increase in subscriptions, which is an encouraging sign for the society. However, as in 2013, the cost of producing *Malimbus* in 2014 was higher than our income from subscriptions. The combined balance decreased from last year by £527, a result of the 2014 deficit of £311 combined with a loss of £271 on the Euro balance of 1 Jan 2014 (due to a decrease in the value of the Euro against the Pound from 0.835 on 1 January to 0.783 on 31 December) and a gain of £55 on the transfer between accounts. Any apparent errors of £1 in the above tables are due to rounding.

The sterling balance comprised £713 in the bank and £34 in cash on 1 Jan 2014, and £1971 in the bank and £61 in cash on 31 Dec 2014.

Thanks to Nils and Marine Robin for managing the WAOS Euro account.

T. Dodman, Treasurer and Membership Secretary

Instructions to Authors

Malimbus publishes research articles, reviews and news about West African ornithology.

Papers and **Short Notes** must be original contributions; material published elsewhere, in whole or in part, will not normally be accepted. Short Notes are articles not exceeding 1500 words (including references) or four printed pages in length. Wherever possible, manuscripts should first have been critically scrutinised by at least one other ornithologist or biologist before submission. Manuscripts will be sent for critical review to at least one relevant authority.

Items for **News & Comment** should not exceed 1000 words.

Contributions are accepted in English or French; editorial assistance will be made available to authors whose first language is not one of these. Submission by email (attached file) is preferred. Consult the editor for further details, *e.g.* acceptable software.

All Papers (but not Short Notes) should include a **Summary**, not exceeding 5 % of the paper's length. The Summary should include brief reference to major findings of the paper and not simply review what was done. Summaries will be published in both English and French (or in the official language of the country in which the work was done) and will be translated as appropriate by the Editorial Board.

Format of tabular material, numbers, metric units, references, *etc.* should match recent issues. Note particularly: authors' names should be listed with surname (family name) last, with given names or initials preceding it (*e.g.* John A. SMITH); dates are written 2 Feb 1990 but months standing alone may be written in full; times of day are written 6h45, 17h32 and coordinates as *e.g.* 7°46′13″N (no leading zeros) or as decimal degrees to up to five decimal places (*e.g.* 1.23456°N), but not as decimal minutes; numbers up to ten are written in full, except when followed by abbreviated units (*e.g.* 6 m), numbers from 11 upwards are written in figures except at the beginning of a sentence. All references mentioned in the article, and only such, must be listed in the bibliography.

Avifaunal articles must contain a map or gazetteer, including all localities mentioned. They should include brief notes on climate, topography, vegetation, and conditions or unusual events prior to or during the study (*e.g.* late rains *etc.*). **Species lists** should include only significant information; full lists are justified only for areas previously unstudied or unvisited for many years. Otherwise, include only species for which the study provides new information on range, period of residence, breeding *etc.* For each species, indicate range extensions, an assessment of abundance (see *Malimbus* 17: 36) and dated breeding records; indicate migratory status and period of residence only as shown by the study. Where appropriate, set data in context by brief comparison with an authoritative regional checklist. Lengthy species lists may be in tabular form (*e.g. Malimbus* 25: 4–30, 24: 15–22, 23: 1–22, 1: 22–28, or 1: 49–54) or in the textual format of recent issues. **Taxonomic sequence** and **scientific names** (and preferably also **vernacular names**) should follow either Borrow & Demey (2001, *Birds of Western Africa*, Christopher Helm, London, with names as amended in Borrow & Demey 2004, *Field Guide to the Birds of Western Africa*, Christopher Helm, London), or *The Birds of Africa* (Brown *et al.* 1982, Urban *et al.* 1986, 1997, Fry *et al.* 1988, Keith *et al.* 1992, Fry & Keith 2000, 2004, Academic Press, London), unless reasons for departure from these authorities are stated. A **more complete guide for authors** of avifaunal papers, including the preferred abundance scale, appeared in *Malimbus* 17: 35–39 and an augmented and updated version of this may be found on the web site (http://malimbus.free.fr/instmale.htm). The Editor will be happy to advise on the presentation of specific studies.

When designing **Figures**, and particularly font size, pay attention to *Malimbus* page shape and size. Figures prepared in or scanned into an appropriate graphics package and saved at high resolution are preferred. Low-resolution files and poor-quality scans will not be accepted. Authors are encouraged to submit **photographs** that illustrate salient points of their articles. Photographs should preferably be in colour and at high resolution. Figures and photographs should be supplied as graphics files (*e.g.* jpg or tif), and not pasted into a Word file. Consult the Editor for further advice.

A pdf file of Papers and Short Notes, and one copy of the issue in which they appear, will be sent to single or senior authors, *gratis*.

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